

REPORT DOCUMENTATION PAGE

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1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3.
		0001 01 December 1997 - 31 October 1998
4. TITLE AND SUBTITLE An Improved SPH Technique for Fracture Modeling		5. FUNDING NUMBERS F49620-98-1-0148
6. AUTHOR(S) Prof. Libersky Prof. Carney		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) New Mexico Inst. of Mining and Technology Research and Development Campus Station Socorro, NM 87801		8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) AFOSR 801 N. Randolph Street, Room 732 Arlington, VA 22203-1977		10. SPONSORING/MONITORING AGENCY REPORT NUMBER F49620-98-1-0148
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13. ABSTRACT (Maximum 200 words) The purpose of the proposed research was to enhance the Smoothed Particle Hydrodynamics (SPH) code named MAGI. With these improvements, the MAGI code could solve the enormously complex problem of simulating Behind-Armor-Debris and subsequent interaction of the spall cloud with threat target components as well as the fragmentation of warheads and other explosively driven devices. The proposed work would have involved several improvements to the numerical implementation of SPH. This was possible, as two of the worlds leading experts in SPH, Larry Libersky and Ted Carney, were employed by NMIMT/EMRTC and both contributed to the proposal. The PI's were intending to add contact and free-surface boundary conditions to the normalized version of MAGI. The one-dimensional case was completed when work was suspended. Unfortunately, by the time the contract was delivered, Larry Libersky had left EMRTC and Ted Carney resigned soon after. There were no other researchers at EMRTC that were competent to complete the contract, so the work was suspended and the contract terminated.		
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Energetic Materials Research and Testing Center

801 Leroy Place ♦ Socorro, NM 87801

Phone: (505) 835-5312 ♦ Fax: (505) 835-5630 ♦ <http://www.emrtc.nmt.edu>

AN IMPROVED SPH TECHNIQUE FOR FRACTURE MODELING

Final Technical Report Submitted to:

AFOSR/NM
110 Duncan Avenue, Room B115
Bolling AFB, DC 20332-8050

Grant No. F49620-98-1-0148

DISTRIBUTION STATEMENT A
Approved for Public Release
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Energetic Materials Research and Testing Center
New Mexico Tech, Socorro, NM 87801


June 15, 2000

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REPORT OF INVENTIONS AND SUBCONTRACTS (Pursuant to "Patent Rights" Contract Clause) (See Instructions on Reverse Side.)										Form Approved OMB No. 0704-0240 Expire June 30, 1992	
1a NAME OF CONTRACTOR/SUBCONTRACTOR NM Inst of Mining & Technology		c CONTRACT NUMBER F49620-98-1-0148		2a NAME OF GOVERNMENT PRIME CONTRACTOR AFOSR/NIM		c CONTRACT NUMBER F49620-98-1-0148		3. TYPE OF REPORT (X one) a. INTERIM <input type="checkbox"/> b. FINAL <input checked="" type="checkbox"/>			
b ADDRESS (Include ZIP Code) EMRTC 801 Leroy Place Socorro, NM 87801		AWARD DATE (YYMMDD) 19971201		b ADDRESS (Include ZIP Code) 110 Duncan Ave., Rm. B115 Bolling AFB, DC 20332-8050		d AWARD DATE (YYMMDD) 19971201		4. REPORTING PERIOD (YYMMDD) a. FROM 19971201 b. TO 19980831			
SECTION I - SUBJECT INVENTIONS											
5. "SUBJECT INVENTIONS" REQUIRED TO BE REPORTED BY CONTRACTOR/SUBCONTRACTOR (If "None," so state)											
a. NAME(S) OF INVENTOR(S) (Last, First, MI)		b. TITLE OF INVENTION(S)		c. DISCLOSURE NO. PATENT APPLICATION SERIAL NO. OR PATENT NO.		d. ELECTION TO FILE PATENT APPLICATIONS (1) United States (a) Yes (b) No (c) Yes (d) No (2) Foreign		e. CONFIRMATORY INSTRUMENT OR ASSIGNMENT FORWARDED TO CONTRACTING OFFICER (1) Yes (2) No			
NONE											
f. EMPLOYER OF INVENTOR(S) NOT EMPLOYED BY CONTRACTOR/SUBCONTRACTOR											
(1)(e) Name of Inventor (Last, First, MI)		(2)(a) Name of Inventor (Last, First, MI)		(1) Title of Invention		(2) Foreign Countries of Patent Application					
(b) Name of Employer		(b) Name of Employer									
(c) Address of Employer (Include ZIP Code)		(c) Address of Employer (Include ZIP Code)									
SECTION II - SUBCONTRACTS (Containing a "Patent Rights" clause)											
6. SUBCONTRACTS AWARDED BY CONTRACTOR/SUBCONTRACTOR (If "None," so state)											
a. NAME OF SUBCONTRACTOR(S)		b. ADDRESS (Include ZIP Code)		c. SUBCONTRACTOR NO.(S)		d. DFAR "PATENT RIGHTS" (1) Clause Number (2) Date (YYMM)		e. DESCRIPTION OF WORK TO BE PERFORMED UNDER SUBCONTRACT(S)		f. SUBCONTRACT DATES (YYMMDD) (1) Award (2) Estimated Completion	
NONE											
SECTION III - CERTIFICATION											
7. CERTIFICATION OF REPORT BY CONTRACTOR/SUBCONTRACTOR (Not required if Small Business or X Non-Profit organization.) (X a											
a. NAME OF AUTHORIZED CONTRACTOR/SUBCONTRACTOR OFFICIAL (Last, First, MI)		c. I certify that the reporting party has procedures for prompt identification and timely disclosure of "Subject Inventions," that such procedures have been followed and that all "Subject Inventions" have been reported.									
b. TITLE W.D. Peterson Vice President for Admin & Finance		SIGNATURE 		DATE SIGNED 4/19/00							
DD Form 882 Previous editions are obsolete.											



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DEPARTMENT OF THE AIR FORCE
Air Force Office of Scientific Research / NM
110 Duncan Avenue Room B115
Bolling AFB, DC 20332-8050

RE: F49620-98-1-0148
Final Technical Report
Final Invention Report

Enclosed are the final reporting requirements under the referenced contract. New Mexico Tech and EMRTC appreciate your research opportunities and would like to work with you again in the future.

The Technical Report is limited to the initial work began by the Principal Investigator, T. Carney. He left New Mexico Tech, and therefore, was unable to complete the entire contract requirements.

If you need additional information, contact Gayle Jones at 505-835-5810.

Sincerely,

W.D. Peterson
Vice President for Admin. & Finance
NMIMT

xc: W. Veon
L. Sakell